Dissertation On

"COMPARISON BETWEEN POSTERIOR AND LATERAL APPROACHES OF POPLITEAL BLOCK FOR LOWERLIMB EMERGENCY MINOR SURGICAL PROCEDURES"

Submitted to the **TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY**

In partial fulfillment of the requirements for the award of degree of

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GOVERNMENT STANLEY MEDICAL

COLLEGE&HOSPITAL

THE TAMILNADU Dr.M.G.R. MEDICAL UNIVERSITY

CHENNAI, TAMILNADU

MARCH 2009

CERTIFICATE

This is to certify that this dissertation entitled dissertation on "**Comparison between posterior and lateral approaches of popliteal block for lower limb emergency minor surgical procedures**" is the bonafide original work of Dr.RADHAKRISHNAN.A, in partial fulfillment of the requirement for MD anaesthesiology examination of the Tamilnadu Dr. MGR Medical University to be held in March 2009.

Prof. Dr. J. Mohanasundaram
M.D. Phd. D.N.B.

DEAN
Govt. Stanley medical college and Hospital
Chennai-600 001.

Prof.Dr.P.Chadrasekar M.D. D.A.,
Head of the department
Department of Anaesthesiology,
Govt. Stanley medical college and Hospital, Chennai-600 001.

DECLARATION

I, Dr.RADHAKRISHNAN.A, solemnly declare that dissertation titled, **Comparison between posterior and lateral approaches of popliteal block for lower limb emergency minor surgical procedures** is the bonafide work done by me at Govt. .Stanley medical college and hospital during the period August 2007 to August 2008 under the expert guidance and supervision of Prof. Dr. P. Chandrasekar M.D. D.A.

The dissertation is submitted to the Tamilnadu Dr. MGR Medical university towards partial fulfillment of requirement for the award of MD Degree in anaesthesiology.

Place : Chennai

Date : **Dr.RADHAKRISHNAN.A.**

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CONTENTS

INTRODUCTION

The major responsibility of the anaesthesiologist is to provide adequate surgical anaesthesia and post operative analgesia for the patient with minimum complications. No anesthetic technique is successful and safe unless diligent efforts are made to have clear cut anatomical knowledge and proper administration technique.

To accomplish adequate anaesthesia for foot surgeries we have general anaesthesia and regional anaesthetic techniques such as subarachnoid block, epidural block and various peripheral nerve blocks. Popliteal block is one of such peripheral nerve blocks.

Popliteal block is used to block the Sciatic nerve at the popliteal fossa so that the region supplied by it distal to the site is anaesthetized. Successful popliteal block requires sufficient anatomical knowledge and special gadgets such as nerve locator apart from patient cooperation to avoid block failure and complications.

An outstanding feature of nerve blocks including popliteal block is their lack of adverse effects[1] as in general anaesthesia or neuraxial blockade and can give adequate post operative pain relief even if given in a single shot administration. Lignocaine, bupivacaine, ropivacaine and mepivacaine are commonly used local anaesthetic agents[2]. Lignocaine if used along with adrenaline and sodium bicarbonate can result in prolongation of the action apart from reduction of local anaesthetic toxicity.

There are two approaches for popliteal block namely classical or posterior approach and lateral approach. Comparisons have been made between these two approaches for popliteal block administration.

This study was carried out in the Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai between August 2007 to August 2008.

AIM OF THE STUDY

The aim of the study is to compare posterior and lateral approaches of popliteal block for lower limb emergency minor surgical procedures in respect to technical difficulty, patient comfort, branches of sciatic nerve stimulated, complications, onset and duration of action.

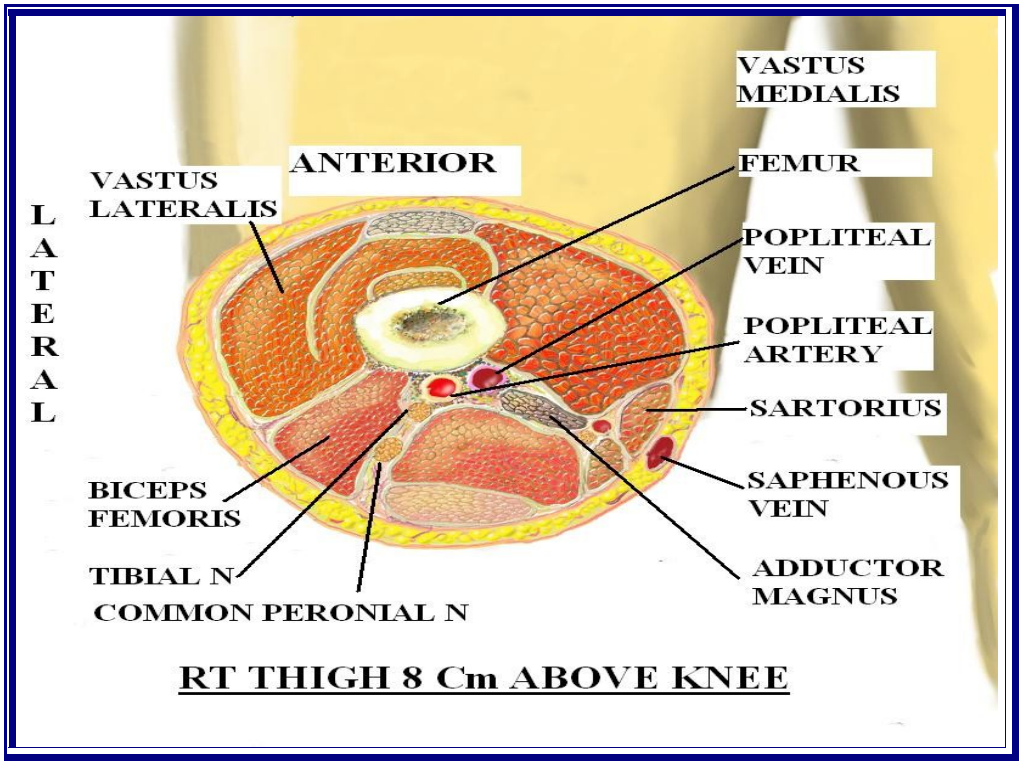
CONCEPT AND TECHNIQUE

The popliteal block is a block of the sciatic nerve at the level of the popliteal fossa. Some common indications[3] include corrective foot surgery, foot debridement, amputation of toes, filleting of toes and Achilles tendon repair. Sound knowledge of the principles of nerve stimulation and anatomic characteristics of the sciatic nerve in the popliteal fossa are essential for its successful implementation.

ANATOMY

The sciatic nerve[4] is a nerve bundle consisting of two separate nerve trunks, the tibial and common peroneal nerves. A common epineural sheath envelops these two nerves as they emerge from pelvis. As the sciatic nerve descends toward the knee, the two components eventually diverge in the popliteal fossa, giving rise to tibial and common peroneal nerves. This division of the sciatic nerve occurs usually between 50 and 120 mm proximal to the popliteal fossa crease. From its divergence from the sciatic nerve, the common peroneal nerve continues its path downward and descends along the head and neck of the fibula. Its major branches in this

region are branches to the knee joint and cutaneous branches that form the sural nerve. Its terminal branches are superficial and deep peroneal nerves.



The tibial nerve is the larger of the two divisions of the sciatic nerve. The tibial nerve continues its path vertically through the popliteal fossa. Its terminal branches are the medial and lateral plantar nerves. Its collateral branches give rise to the cutaneous sural nerves, muscular branches to the muscles to the calf, and articular branches to the ankle joint. It is important

to note that in contrast to the common assumption, the sciatic nerve in the popliteal fossa is lateral and superficial to the popliteal artery and vein and it is not enveloped by the same tissue sheath (neurovascular sheath).

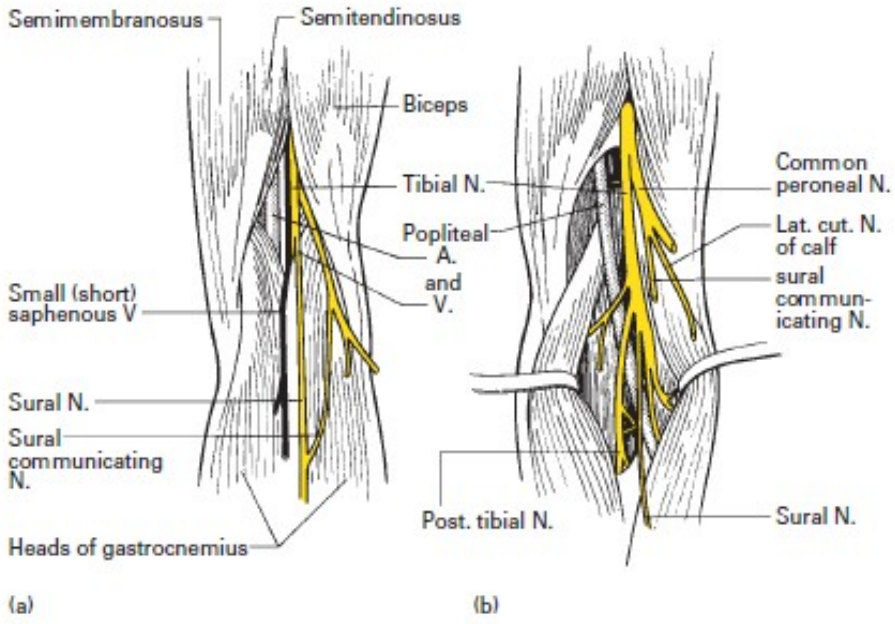


Fig. 142 The popliteal fossa: (a) superficial dissection; (b) deep dissection.

Adipose tissue fills the popliteal fossa with exceptionally less blood vessels. This anatomic characteristic is important to understand why systemic toxicity and vascular punctures are so rare after popliteal blockade.

DISTRIBUTION OF ANESTHESIA

Popliteal blockade results in anesthesia[5] of the entire distal two thirds of the lower extremity, with the exception of the medial aspect of the leg. Cutaneous innervations of the medial leg below the knee is provided by the saphenous nerve, a superficial terminal extension of the femoral nerve. Depending on the level of surgery, the addition of a saphenous nerve block may be required for surgery[6].

For foot surgeries and post operative pain relief popliteal block alone is sufficient. Popliteal block alone is sufficient for the tourniquet pain[7], because this pain is the result of the pressure and ischemia of the deep muscle beds.

EQUIPMENT

A standard regional anesthesia tray is prepared with the following Equipments[8]:

1. Sterile towels and gauze packs

2. Sterile gloves, marking pen, and surface electrode

3. One 1½" 25-gauge needle for skin infiltration

4.5 &10-cm long, short bevel, insulated stimulating needles

5. Peripheral nerve locator

6. Anaesthetic solution 35 mL of 1% lignocaine with 5µg/mL of

adrenaline and 1.5 ml of sodium bi-carbonate.

POPLITEAL BLOCK

POSTERIOR APPROACH[9]

Patient positioning

The patient is in the prone position. The foot on the side to be blocked should be positioned so that even the slightest movements of the foot or toes can be easily observed. This is best achieved by allowing the foot to protrude off the operating table.

Surface Landmarks

The following surface anatomy landmarks are used to deter-mine the insertion point for the needle.

1. Popliteal fossa crease
2. Tendon of biceps femoris (laterally)
3. Tendons of semitendinosus and semimembranosus muscles (medially)

Anatomic Landmarks

Landmarks for the classical approach to popliteal block are easily recognizable even in obese patients. All three landmarks should be outlined by a marking pen:

1. Popliteal fossa crease

2. Tendon of biceps femoris (laterally)

3. Tendons of semitendinosus and semimembranosus (medially)

The needle insertion point is marked at 7cm above the popliteal fossa crease at the midpoint between the tendons. These landmarks can be accentuated by asking the patient to flex the leg at the knee joint. This maneuver tightens the hamstring muscles and allows an easy and accurate palpation of the tendons.

Technique

After a thorough cleaning with an antiseptic solution, local anesthetic is infiltrated subcutaneously. The anesthesiologist is stands at the side of the patient with the palpating hand on the biceps femoris muscle. The needle introduced at the midpoint between the tendons. This position allows the anesthesiologist both to observe the responses to nerve stimulation[10] and to monitor the patient. The nerve stimulator should be initially set to deliver 1.5 mA current (2 Hz, 100µsec) because this higher current allows detection of the inadvertent needle placement into the hamstrings muscles and stimulation of the sciatic nerve through the epineural sheath as the needle is approaching its target. When the needle is inserted in a correct plane, advancement of the needle should not result in any local muscular twitches.

There are two common types of twitches. Common peroneal nerve stimulation results in dorsiflexion and eversion. Stimulation of the tibial nerve results in plantar flexion and inversion. Current is decreased to 0.5 mA. Upon obtaining a response of either division of the sciatic nerve, local anesthetic injected after negative aspiration

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Isolated twitches of the calf muscles should not be accepted because they may be the result of stimulation of the sciatic nerve branches to the calf muscles outside the sciatic nerve sheath.

POPLITEAL BLOCK

LATERAL APPROACH[11]

Patient positioning

The patient is in the supine position. The foot on the side to be blocked should be positioned so that even the slightest movements of the foot or toes can be easily observed. This is best achieved by placing the foot on a foot rest. Attention should be paid so that the Achilles tendon is also protruding off the foot rest. This positioning allows easy visualization of any foot movement during nerve stimulation.

Surface Landmarks

The following surface anatomy landmarks are used to determine the insertion point for the needle:

1. Vastus lateralis muscle
2. Biceps femoris muscle
3. Patella
4. Popliteal fossa crease

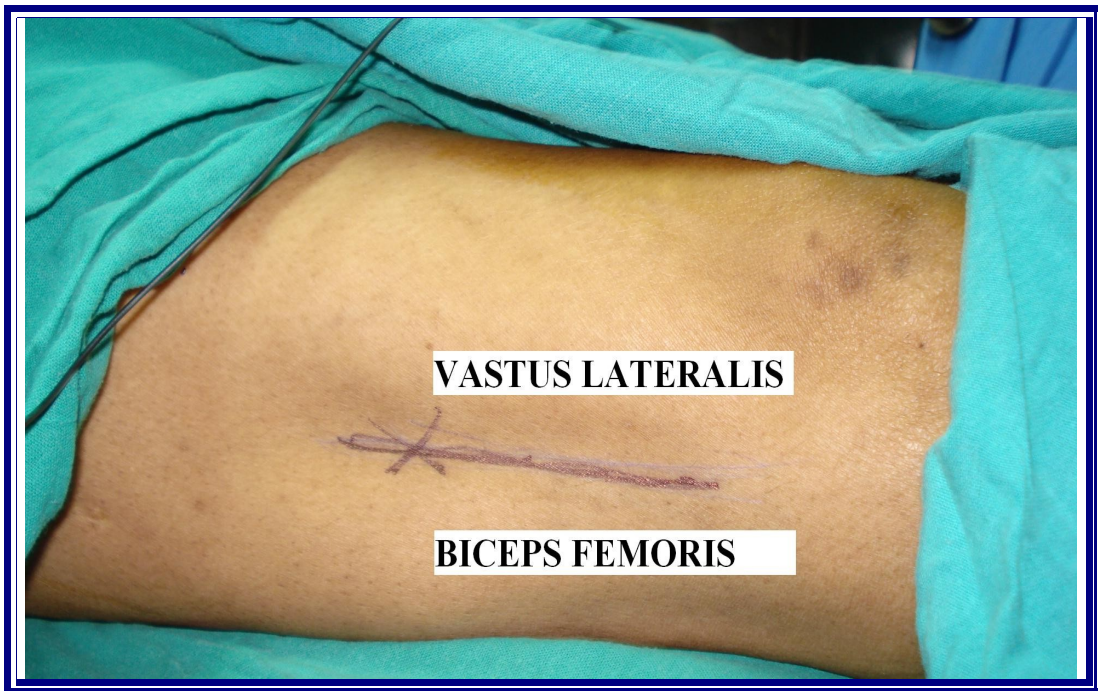
Anatomic Landmarks

Landmarks for the lateral approach to popliteal block include:

1. Popliteal fossa crease

2. Vastus lateralis muscle

3. Biceps femoris muscle



Technique

The needle insertion site is marked in the groove between the vastus lateralis and biceps femoris muscle approximately at 8 cm above the popliteal fossa crease. Asking the patient to lift the foot off the table can be used to accentuate the landmarks in patients in whom the landmarks are not immediately apparent. The operator should be seated, facing the side to be blocked. The height of the bed with the patient is adjusted to allow for an

ergonomic position and a greater precision during block placement. This position also allows the performer to simultaneously monitor both the patient and the responses to nerve stimulation.

The site of needle insertion is cleaned with an antiseptic solution and infiltrated with local anesthetic using a 1½" 25 gauge needle. It is useful to infiltrate the skin in a line, rather than raise a single skin wheel. This allows for a needle reinsertion at a different site when necessary, without a need to anesthetize the skin again.

A 10cm 22G needle is connected to a nerve stimulator, inserted in a horizontal plane between the vastus lateralis and biceps femoris muscles and advanced to contact the femur. The initial current intensity is initially set at 1.5 mA. Keeping the fingers of the palpating hands firmly pressed and immobile in the groove, the needle is then withdrawn to the skin, redirected 30º posterior to the angle at which the femur was contacted and advanced toward the nerve When the sciatic nerve is not localized on the first needle pass, the needle is withdrawn to the skin and reinserted with additional 5-10º posterior redirection. If the maneuvers above fail, reassessment of the landmarks done and the needle is withdrawn to the skin and reinserted 1 cm inferior to the initial insertion site.

The ultimate goal of nerve stimulation is to obtain visible or palpable twitches of the foot or toes at a current of 0.5 mA. Stimulation of the sciatic nerve can result in tibial (plantar flexion) or common peroneal (dorsiflexion) response. Isolated twitches of the calf muscles should not be accepted because they may be the result of stimulation of the sciatic nerve branches to the calf muscles that may be outside the sciatic nerve sheath. After the initial stimulation of the sciatic nerve is obtained, the stimulating current is gradually decreased until twitches are still seen or felt at 0.5 mA. At this point, the needle is stabilized and after negative aspiration for blood, local

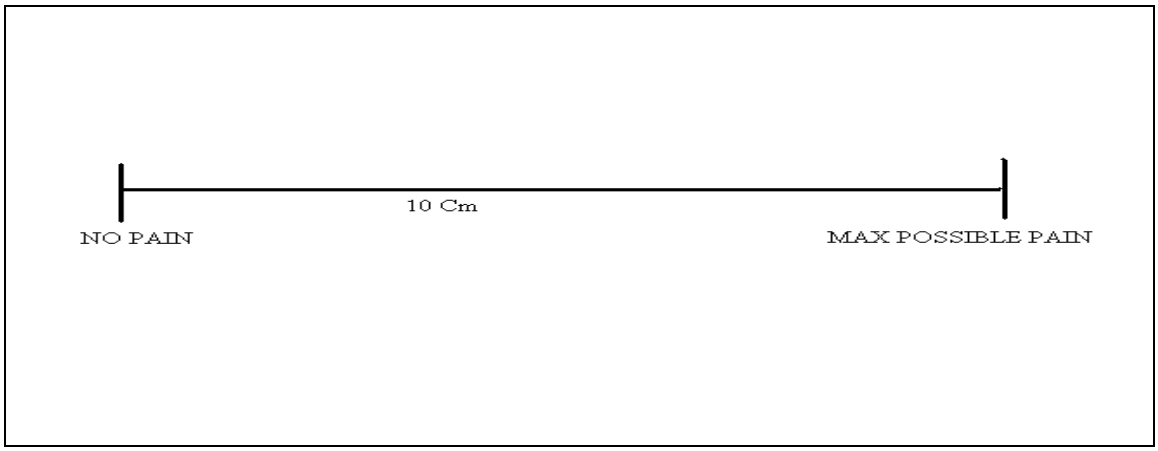
anesthetic is slowly injected.

Assessment of discomfort of the technique can be done by Visual Analogue Scale and adequacy of block by pin prick with concomitant inability to perform plantar or dorsal flexion of the foot[23].

Visual analogue scale[12]

A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective this spectrum appears continuous ± their pain does not take discrete jumps, as a categorization of none, mild, moderate and severe would suggest. It was to capture this idea of an underlying continuum that the VAS was devised.

Figure: Visual analogue scale



Operationally a VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimetres from the left hand end of the line to the point that the patient marks.

There are many other ways in which VAS have been presented, including vertical lines and lines with extra descriptors. Such an assessment is clearly highly subjective and is less accurate in inter personal comparison. But Visual Analog Scale is the only available pain scoring scale which is easy and comprehensive to do an 'on table' assessment of pain.

COMPLICATIONS[13]

1. Vascular puncture
2. Nerve injury
3. Hematoma
4. Infection

PHARMOCOLOGY OF LIGNOCAINE[14]

Lidocaine, the first amino amide type local anesthetic, was first synthesized under the name xylocaine by Nils Löfgren in 1943. His

colleague Bengt Lundqvist made the first injection anesthesia experiments on himself. It was first marketed in 1948. It is a tertiary amine which is an amide derivative of diethylaminoacetic acid.

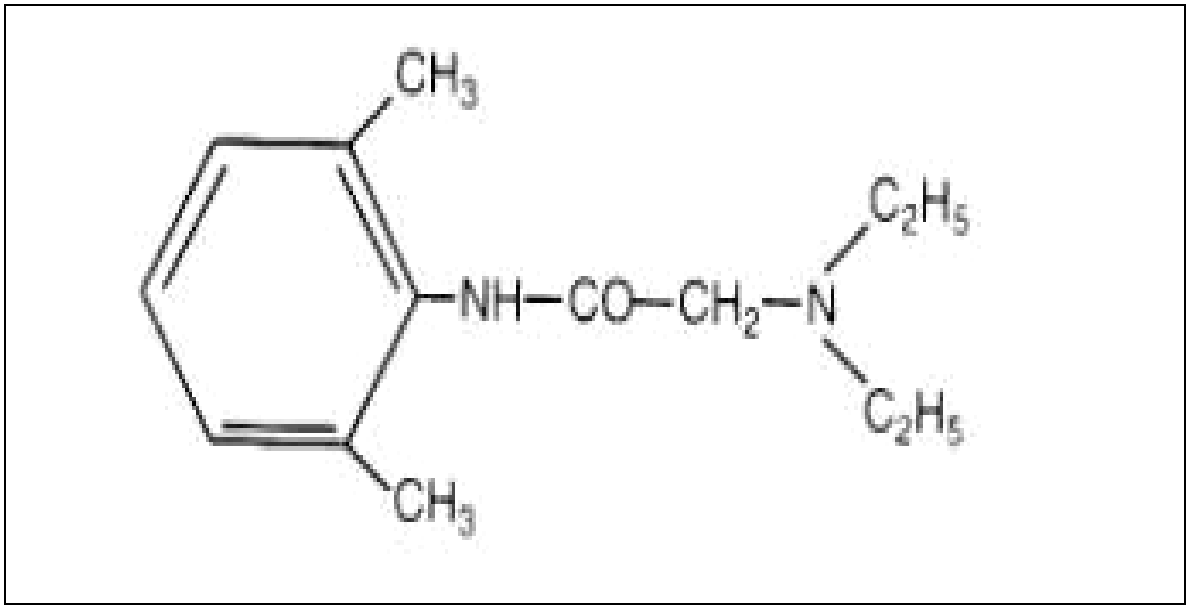
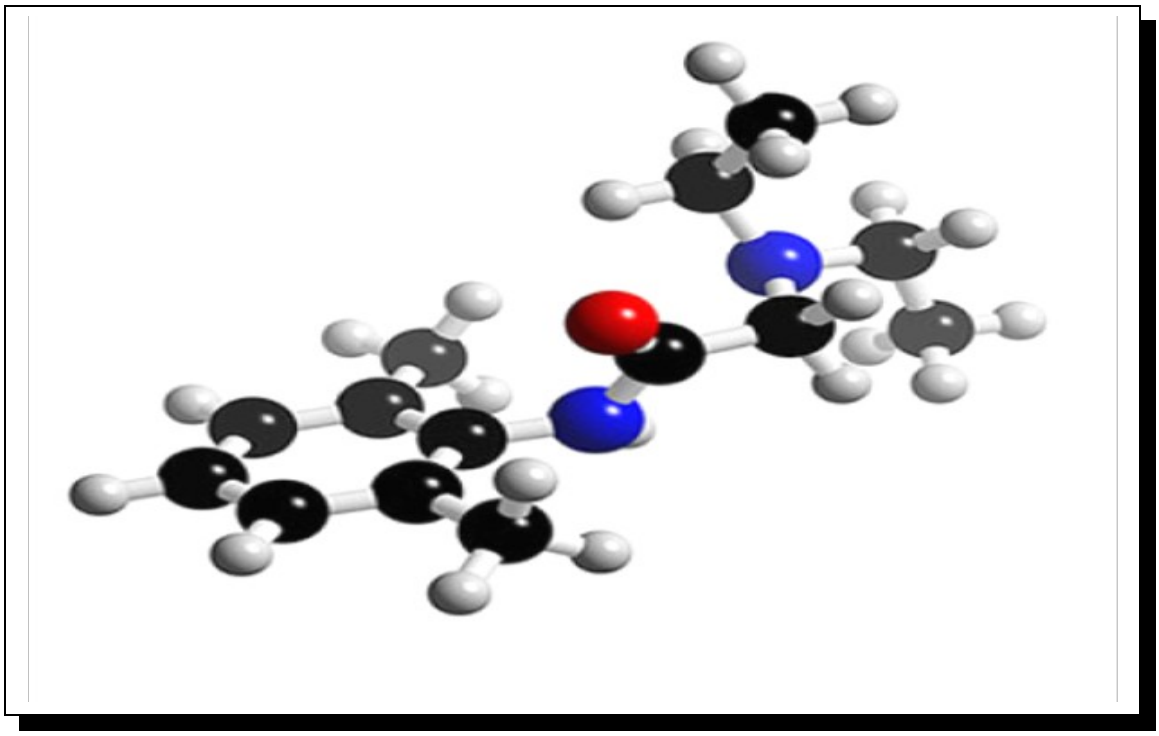


Figure: Chemical formula of Lignocaine

Figure: Schematic diagram of Lignocaine



Pharmacokinetics

Lidocaine is 64% protein bound approximately 90% metabolized in the liver by CYP1A2 isoenzyme and to a minor extent CYP3A4 by N-dealkylation. Pharmacologically-active metabolites are monoethylglycinexylidide and glycinexylidide. The elimination half-life of lidocaine is approximately 1.5–2 hours.

Pharmacodynamics

Lignocaine base is poorly to sparingly soluble in water but is soluble in relatively hydrophobic organic solvents. Therefore, as a matter of

convenience, it is marketed as the hydrochloride salts. The p*K*a (7.7) of the drug and tissue pH determine the amount of drug that exists in solution as free base or as positively charged cation. When injected lidocaine, is less bound to tissues but is still more membrane permeable. The onset of conduction block in isolated nerves is dependent on the dose, concentration and pH.

The duration of action depends upon the vascularity of the tissue, protein binding and addition of vasopressors. Dose is 3 mg/kg or 7 mg/kg if used with adrenaline.

Adverse effects

Systemic exposure to excessive quantities of lidocaine mainly result in central nervous system (CNS) and cardiovascular effects – CNS effects usually occur at lower blood plasma concentrations and cardiovascular effects occurs at higher concentrations, though cardiovascular collapse may also occur with low concentrations. CNS effects may include CNS excitation (nervousness, tingling around the mouth, tinnitus, tremor, dizziness, blurred vision, seizures) followed by depression. With increasingly heavier exposure: drowsiness, loss of consciousness, respiratory

depression and apnea occurs. Cardiovascular effects include hypotension, bradycardia, arrhythmias, and cardiac arrest. Some of which may be due to hypoxemia secondary to respiratory depression.

Carbonation and pH Adjustment of Local Anesthetics[15]

The addition of bicarbonate to a solution of local anesthetic applied to an isolated nerve accelerates the onset and decreases the minimum concentration (Cm) required for conduction blockade. Carbonated solutions appear to improve the depth of sensory and motor blockade. In addition, these solutions may produce a more complete blockade of the peripheral nerve.

The addition of sodium bicarbonate to local anesthetic solutions has also been reported to decrease the time of onset of conduction blockade. An increase in the pH of the local anesthetic solution increases the amount of drug in the uncharged base form, which enhances the rate of diffusion across the nerve sheath and nerve membrane and result in a more rapid onset of anesthesia.

Addition of Vasoconstrictors[16]

Vasoconstrictors, usually epinephrine (5 μg/mL or 1:200,000), are frequently included in local anesthetic solutions to decrease the rate of vascular absorption. They allow more anesthetic molecules to reach the nerve membrane and thus improve the depth and duration of anesthesia, as well as providing a marker for inadvertent intravascular injection. Epinephrine in a concentration of 1:200,000 has been reported to provide the optimal degree of vasoconstriction when used with Lidocaine for epidural or peripheral nerve application. Other vasoconstrictors such as norepinephrine and phenylephrine have been used but do not appear to be superior to epinephrine. The extent to which epinephrine prolongs the duration of anesthesia depends on the specific local anesthetic used and the site of injection. Epinephrine will significantly extend the duration of both infiltration anesthesia and peripheral nerve blocks with shorter-duration drugs such as lidocaine.

Blockade by local anesthetics may be summarized[17] by the following

chronology.

1. Solutions of local anesthetic are deposited near the nerve. Diffusion of drug molecules away from this locus is a function of tissue binding, removal by the circulation, and local hydrolysis of amino ester anesthetics. The net result is penetration of the nerve sheath by the remaining drug molecules.

2. Local anesthetic molecules then permeate the nerve's axon membranes and reside there and in the axoplasm. The speed and extent of these processes depend on a particular drug's p*K*a and the lipophilicity of its base and cation species.

3. Binding of local anesthetic to sites on voltage-gated Na+ channels prevents opening of the channels by inhibiting the conformational changes that underlie channel activation. Local anesthetics bind in the channel's pore and also occlude the path of Na+ ions.

4. During onset and recovery from local anesthesia, impulse blockade is incomplete, and partially blocked fibers are further inhibited by repetitive stimulation, which produces an additional, use-dependent binding to Na+

channels.

5. One local anesthetic binding site on the Na+ channel may be sufficient to account for the drug's resting (tonic) and use-dependent (phasic) actions. Access to this site may potentially involve multiple pathways, but for clinical local anesthetics, the primary route is the hydrophobic approach from within the axon membrane.

6. The clinically observed rates of onset and recovery from blockade are governed by the relatively slow diffusion of local anesthetic molecules into and out of the whole nerve, not by their much faster binding and dissociation to ion channels.

REVIEW OF LITERATURE

1. In 1968, Sunderland elaborately described the anatomy of Sciatic nerve and its tibial and common peroneal divisions and all possible levels where the nerve transmission can be blocked due to injury. In his study he elaborated the detailed microanatomy of a peripheral nerve including epineurium, perineurium and endoneurium. He also described various factors which can block nerve transmission such as pressure, ischemia and local anaesthetics. Nerves and Nerve Injuries. Edinburgh and London, E. & S. Livingstone LTD 1968, pp 1012-95.

2. In 1980 Rorie DK, Byer DE, Nelson DO, et al published the first case report of Popliteal block as “Assessment of block of the sciatic nerve in the popliteal fossa” using procaine 1% (30mL) as the anaesthetic agent. They did with anatomical land marks with classical or posterior approach and showed a success rate of about 66%. Anesth Analg 1980 133-138.

3.In 1985Gouverneur JM.: Sciatic nerve block in the popliteal fossa

with specially designed atraumatic needles and nerve stimulation. He concluded that short bevelled needles with nerve stimulator had better success rate (96%) than the blind technique (54%). He used Lignocaine 1.5%, mepivicaine 1% & Bupivacaine 0.25%. He showed success rate of 90%.Acta Anaesth Belgica 1985;4:391-9.

4. Davis and McGlade By comparing blind technique with nerve stimulator over two hundred patients have shown that without a nerve stimulator, sciatic nerve blocks are frequently unsuccessful. They showed a success rate of 93% with and 67%without nerve locator. They used 1.5% mepivacaine at a volume of25 mL. *Davies MJ, McGlade DP.* Two hundred sciatic nerve blocks: a comparison of localization techniques and peripheral nerve stimulators. Anesth Intens Care 1993; 21: 76-78.

5. The lateral approach was proposed by Collum and Courkney in 1993.They studied different approaches for popliteal block such as posterior approach with surface land marks, posterior approach by intertendinous approach and lateral approach over 50 patients for each group with 30 ml of 0.5% bupivacaine. They proposed that Lateral approach of popliteal block is as safe as the Classical approach. Anaesth Intesive Care 1993; 21:

6. In 1995 Vloka JD, Hadzic A, Lesser J, Mulcare R, Kitain E compared popliteal nerve block with posterior cutaneous nerve of the thigh block versus spinal anaesthesia and demonstrated that both are equally good in anaesthesia and former is devoid of complications like hypotension, bradycardia, post dural puncture headache and meningitis. Complications associated with popliteal block like vascular puncture, nerve injury, hematoma and infection are relatively rare (<2%) and than that of complications associated spinal anaesthesia (70%). Anaesthesia for short saphenous vein stripping: Reg Anesth 1995;20(2S):104.

7. In 1997 Thys DM: after doing 30 cadaver dissections described that a common epineural sheath exists for the tibial and peroneal components of the sciatic nerve in the popliteal fossa. They extrapolated it to 30 patients by giving popliteal block using a nerve locator and 25 mL of 1.5% mepivacaine. They showed that either of the division could be stimulated to

achieve a complete block of the Sciatic nerve for popliteal block. Anesth Analg 1997; 84:387-90

8. At the same year Benzon HT, Kim C, Benzon HP, et al: Studied correlation between evoked motor response of the sciatic nerve and sensory blockade and described the surface landmarks of popliteal block for lateral approach. Anesthesiology 1997; 87:548-52.

9. Jan, R.A.et.al worked on 450 patients from September 1997-March 2000 for any neurological complications after popliteal nerve block for foot/ ankle surgery using posterior approach with nerve locator at 0.5 mA or less current. Local anesthetics used were lignocaine, mepivicaine, ropivacaine, and bupivacaine with and without Adrenaline and sodium bicarbonate. There was no evidence of any local infection, hematoma formation, neuralgia, or neuropraxia. They proved that Adrenaline (5µg/mL) and sodium bicarbonate (1.5 to 2 mL) if used in combination with local anaesthetics prolongs the duration of anaesthesia and reduces the local anaesthetic toxicity. Jan,R.A.; Kerner, M.; Provenzano, D.A.; Adams,

S.B.;Viscusi, E.R. Anesthesiology, Jefferson Medical College, Thomas Jefferson University, Philadelphia, PA.

10. In 1998 Hadzic A, Vloka JD: Compared posterior and lateral approaches of popliteal block(40 patients each) with lignocaine 1.5% (30 mL) and adrenaline using a nerve locator and demonstrated that Lateral approach is equally efficient as the Posterior approach but is technically difficult. They described the technical difficulty as number of attempts to achieve muscle contraction with a current of 0.5 mA.

They demonstrated that 8o% of patients in posterior approach had muscle contraction in the first attempt but in lateral approach it was only 20%. Anesthesiology 1998; 88:1480-6

11. In 2000 Ilfeld BM, Morey TE, Wang RD, Enneking FK did a randomized, double-blinded, placebo-controlled study using Lignocaine(0.75%) with Adrenaline for continuous classical popliteal sciatic

nerve block for postoperative pain control at home. They described that popliteal block can be used for patient control analgesia as a home therapy and is safe, effective, needs little monitoring and cost effective :. Anesthesiology 2000; 97:959-65.

12. In 2002 Hadzic A, Vloka JD, Singson R, Santos AC, Thys DM: compared intertendinous and classical approaches to continuous popliteal nerve block using magnetic resonance imaging simulation for catheter placement. Anesth Analg 2002; 94:1321-4

13. In 2006 Manuel Taboada et al studied over the volume of local anaesthetic required for sciatic nerve block at subgluteal site and popliteal fossa using 1% lignocaine. They showed that the mean volume of local anesthetic required to block the sciatic nerve was 12 ± 3 mL in the subgluteal group and 35 ± 3 mL in the popliteal group ($P < 0.05$). The authors conclude that a larger volume of local anesthetic is necessary to block the sciatic nerve at a more distal site (popliteal approach) as compared with a more proximal

level (subgluteal approach). Anesth Analg 2006;102:593-597

14. In 2006 Dr. Palaniappan T.Dr. Vani S.Dr. Ravikumar S.Dr. Mohan.V compared the posterior approach with the lateral approach of popliteal block using 1.5% Lignocaine (30 mL) with adrenaline. This study shows that the lateral approach that is performed with the patient in supine position is as effective and safe, as the classical posterior block. The success of blockade and number of attempts were better in the posterior approach than lateral approach. However, the nerve stimulation and importantly, the comfort level of the subject (i.e. less pain) favoured the lateral approach. Comparison of Popliteal Blocks For Diabetic Foot Surgeries. Indian journal of Anaesthesia 2006. 50 (4) : 262 -265.

MATERIALS AND METHODS

PATIENT SELECTION

INCLUSION CRITERIA

A total of 60 patients[18] undergoing foot and ankle surgeries were randomized into two groups ,Group (P) for posterior approach and Group (L) for lateral approach after institutional ethical committee approval and informed consent to receive popliteal block using either the lateral or the posterior approach.

All the patients who were selected belonged to American Society of Anaesthesiologist (ASA) Grade I and II (mild systemic disease that does not limit activity [II][19].

Informed consent to receive popliteal block explaining the complications of the technique was obtained.

EXCLUSION CRITERIA

1. All patients sensitive to Lignocaine
2. Age less than 18 and greater than 70
3. Obesity – surface landmark problems
4. Weight < 40kg
5. Patients with problems in positioning
6. Contraindications for adrenaline
7. Patient refusal
8. Failure of block

PREOPERATIVE EVALUATION

Informed consent

Detail history including

Hours of fasting

Habits

Medical problems and surgical procedures

Routine clinical examination including

Airway assessment (Modified Mallampatti classification)

Spine

Vitals

CVS, RS, etc.

Investigations such as

Hb, Blood urea, Creatinine, Random Blood sugar, ECG, Chest X ray

Lignocaine test dose

Random assignment to the lateral or posterior popliteal block was done before surgery.

PROCEDURE

Patient was shifted to a fully equipped operation theatre. I.v line and i.v fluid started. Monitors such as pulseoximeter, ECG, and NIBP connected. Patient positioned according to the type of approach. Skin prepared with 5%Povidone Iodine paint followed by surgical spirit. Draping done with sterile linen.

After infiltrating the point of entry in the skin with 1% lidocaine 1 ml, the sciatic nerve is stimulated and response of the foot elicited. Lowest possible strength of current 0.4-0.5 m A in locating the nerve. The local anaesthetic used to perform the block is 35 ml of 1% lignocaine with 5µg/mL of adrenaline and 1.5 ml of sodium bi-carbonate.

Vital signs recorded through out the procedure. Discomfort of the injection technique assessed with visual analogue scale. The time of onset assessed by using pinprick at lateral malleolus after 10 minutes thereafter for every 5min for 30 minutes after the injection. Duration of anaesthesia was assessed with time of onset of pain after surgery as told by the patient.

OBSERVATION AND RESULTS

This study was conducted at Government Stanley Medical College and Hospital in emergency operation theatres.

TYPE OF SURGERIES

	GROUP P	GROUP L	TOTAL
TendoAchilles cut - repair	5	5	10
Diabetic foot - Debridement	12	12	24
Trauma - Toe amputation	5	5	10
Trauma -Toe filleting	2	2	4
Trauma - foot Debridement	6	6	12

ASA Grade

All patient of both groups except Diabetic foot belonged to ASA Grade 1.

Diabetic foot patients belong to ASA Grade 2.

STATISTICAL ANALYSIS [20]

The sample of 60 group was taken for the study. Data was expressed as mean ± SD or absolute values. Qualitative analysis was compared with Chi square test and quantitative analysis was compared with student 't' test.

The level of statistical significance was set at $p<0.05$.

The patient in each group was statistically comparable in distribution of age, weight ,height and sex distribution.

Table - 1

Comparison of Age distribution(years)

Group	Count	Mean(years)	Std. Deviation	Student t-test
P	30	46.1	12.53	P= 0.9155
L	30	45.76	11.76	**Not significant**

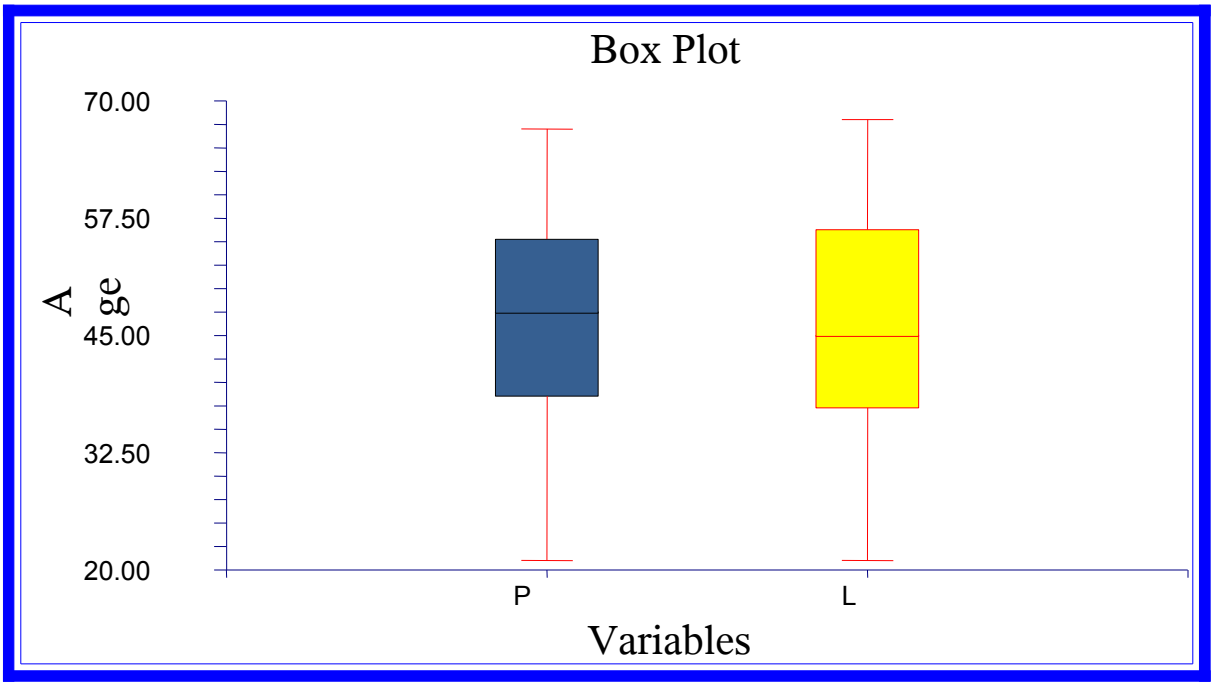
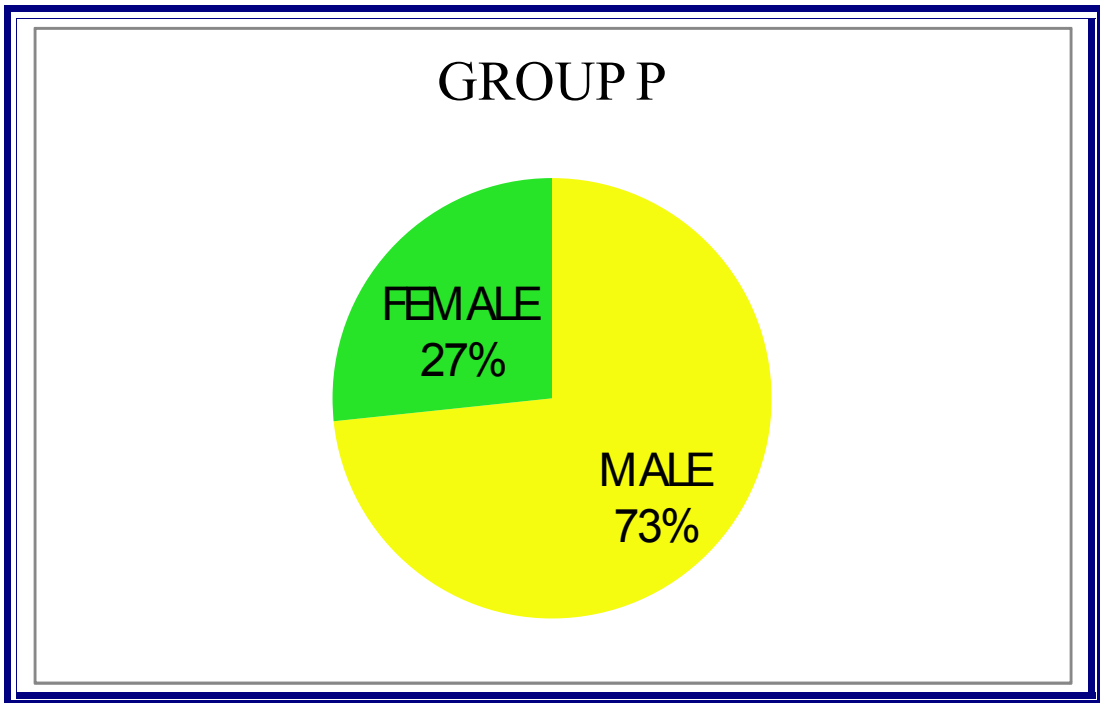


Figure: BOX- PLOT compares the age distribution of Group P and Group L

Table – 2

Comparison of sex

Sex	Group				Chi-square test
	P		L		
	n	%	n	%	
Male	22	74	21	70	P = 0.63 **Not significant**
Female	8	26	9	30	
Total	30	100	30	100	



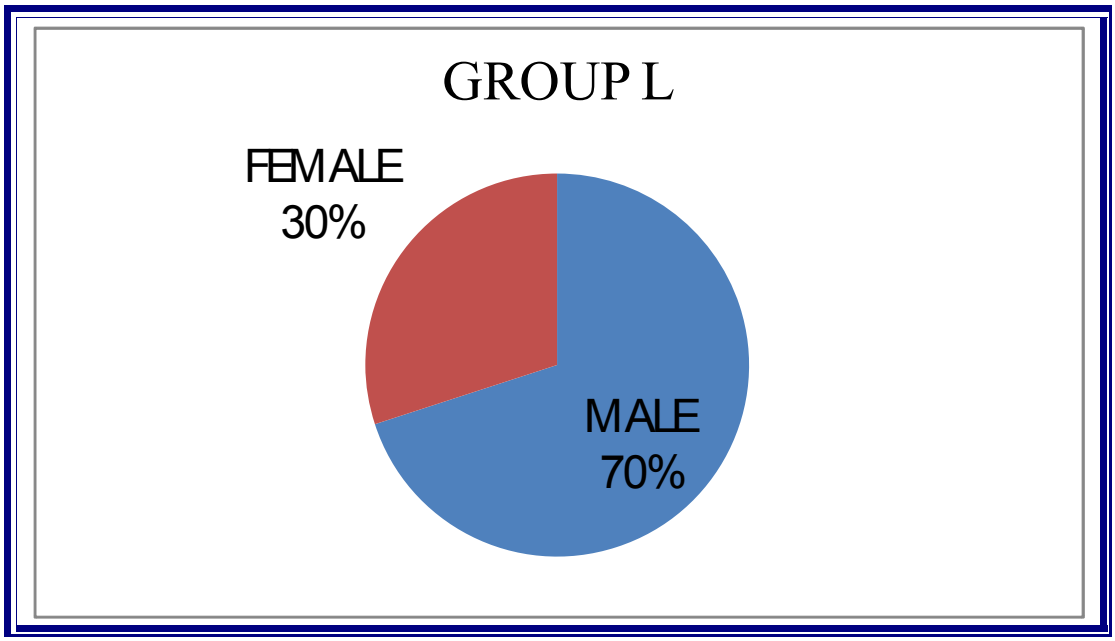


Figure: Pie diagrams shows the sex distribution among Group P andGroup L

Table - 3

Comparison of Weight (kg)

Group	Count	Mean	Std Deviation	Student t-test
P	30	62.86	9.28	P = 0.1213
L	30	59.5	7.14	**Not significant**

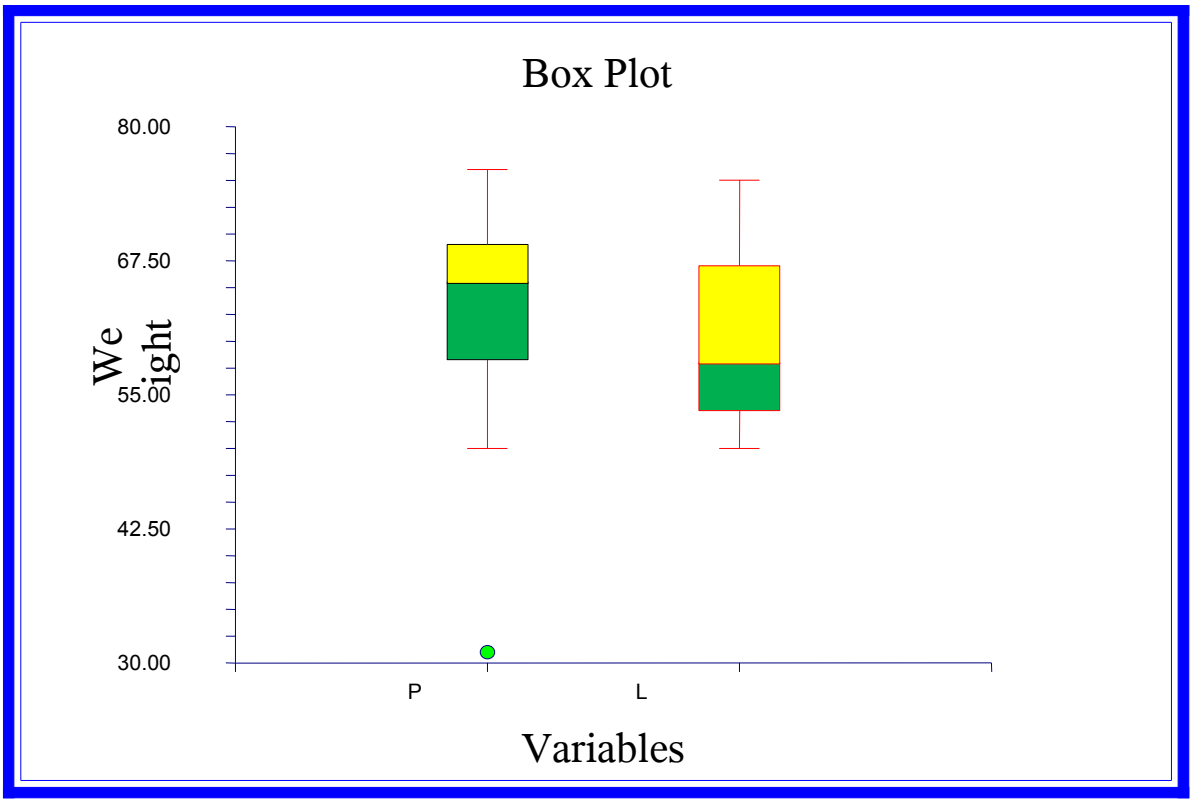


Figure: BOX-PLOT compares the weight distribution of Group P and Group L

Table – 4

Comparison of Height(cm)

Group	Count	Mean	Std Deviation	Student t - test
P	30	161.33	7.57	t = 0.6623
L	30	161.46	7.71	**not significant**

Figure: Box plot shows the distribution of height among Group P and Group L

Table – 5

Comparison of number of attempts

No of Attempts	Group P(30)		Group L(30)		χ^2 for R by C table
	no	%	no	%	
1	20	66	6	20	χ^2= 22.01 Degree of freedom - 2 P = 0.00001661
2	9	30	7	23	
3	1	3	17	56	**Statistically significant**

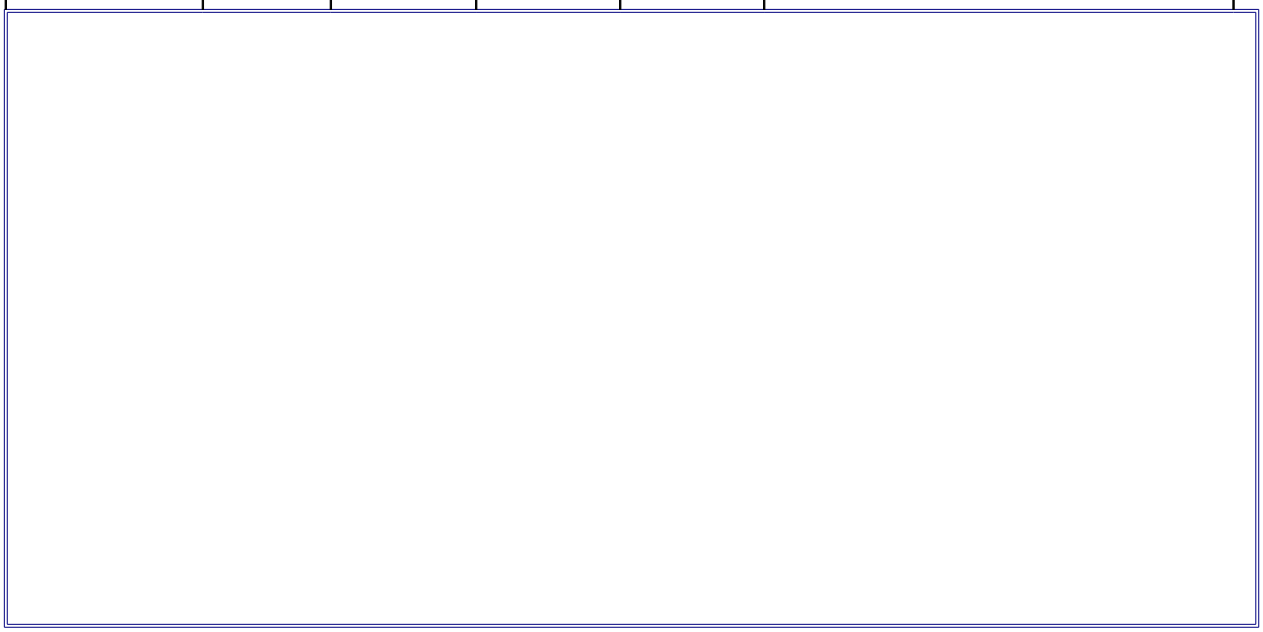


Figure : Bar diagram showing number of attempts among Group P and Group L

Table – 6

Comparison of the nerve stimulated

Nerve stimulated	Group P	Group L	2 × 2 Analysis
Tibial	17	8	$\chi^2 = 5.554$
Peroneal	13	22	P = 0.01844
			Statistically significant

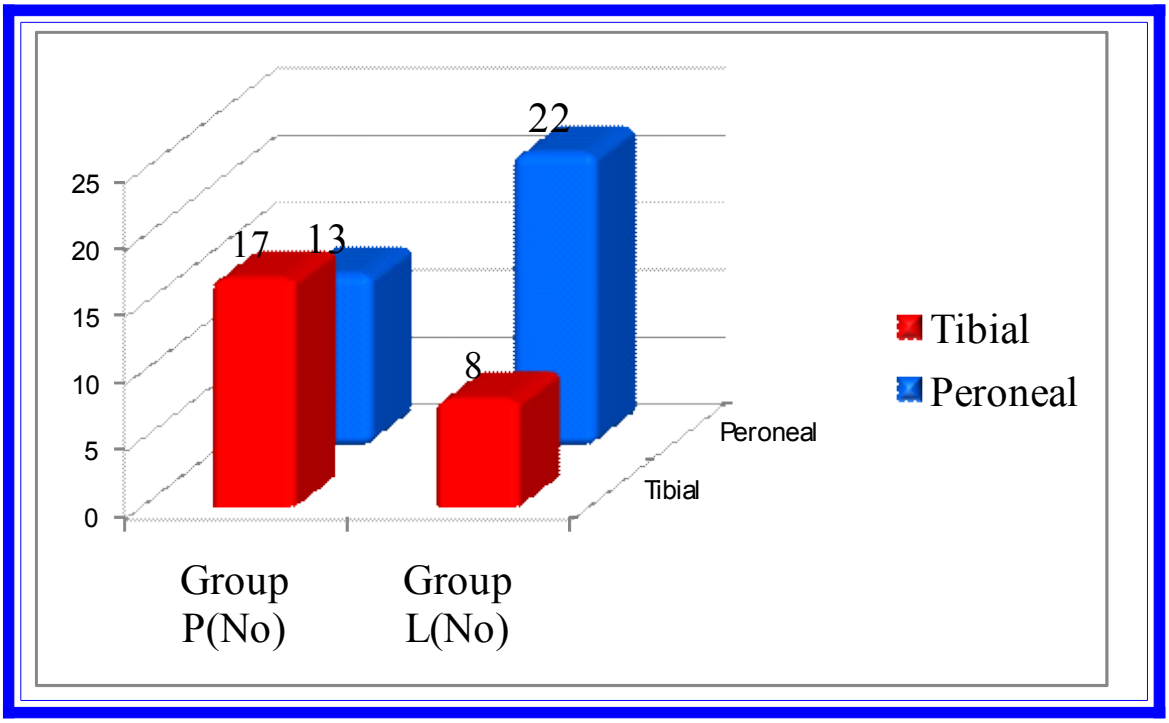


Figure : Bar diagram showing the nerve which is stimulated among Group P and Group L

Table – 7

Comparison of depth of needle insertion to stimulate the nerve(mm)

Depth (mm)	Mean	Std deviation	Student t test
Group P	39.46	3.59	P = 0.0001
Group L	54.83	4.59	**Statistically Significant**

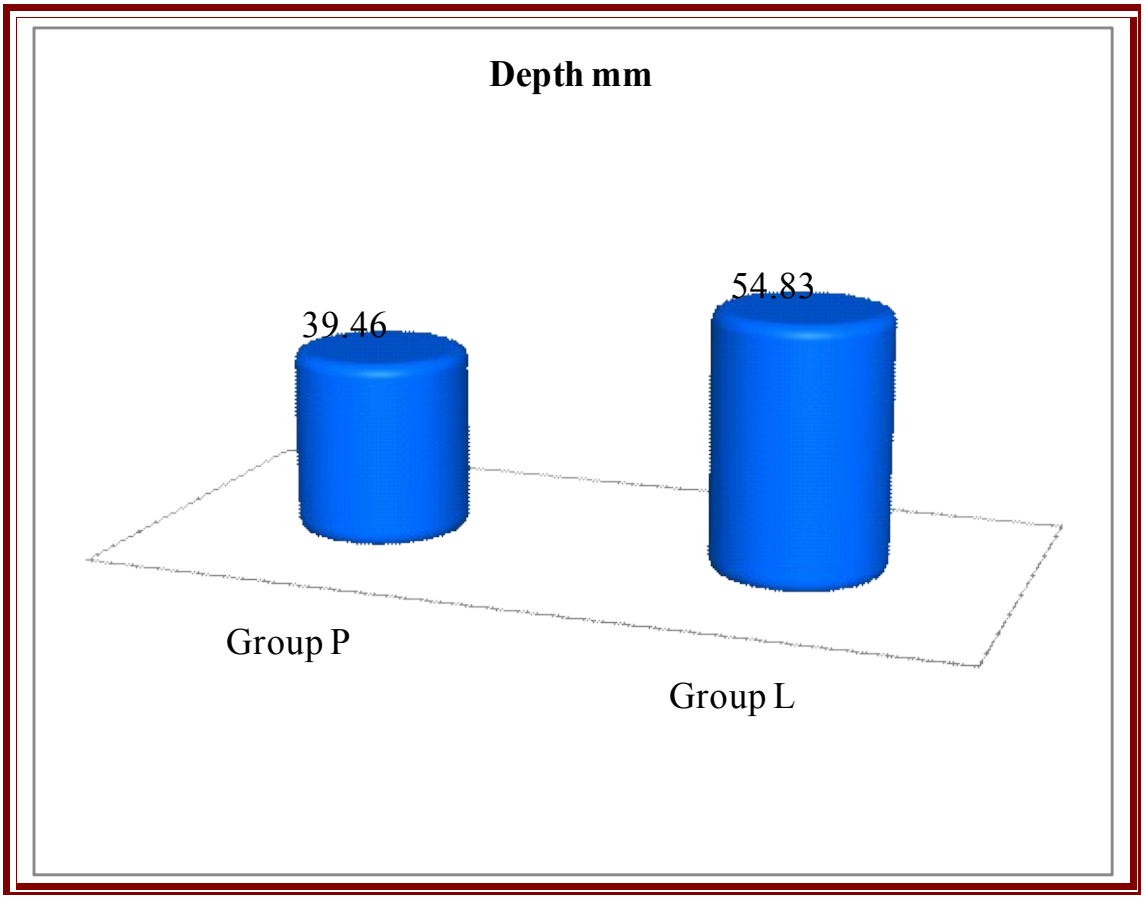


Figure: Showing the depth at which the nerve is located among Group P and Group L

Table – 8

Comparison of Visual Analogue Scale score

Group	Count	Mean VAS	Std deviation	Student t test
P	30	4.26	1.11	P = 0.0001 **Statistically significant**
L	30	1.56	0.72	

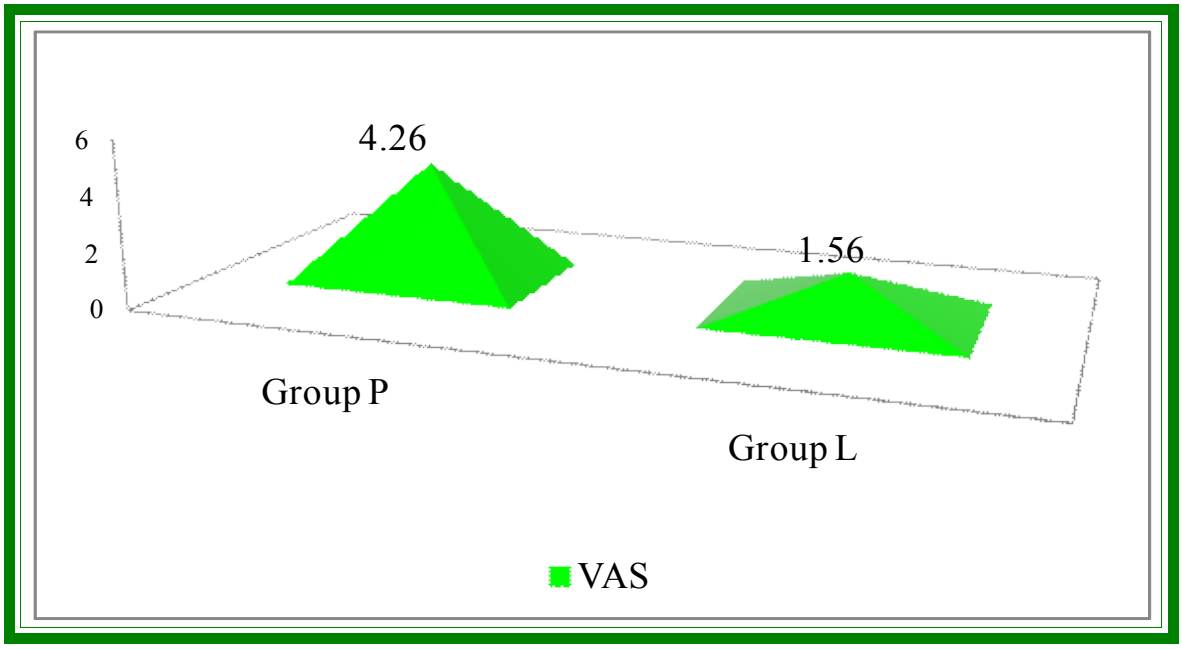


Figure : Showing Visual Analogue Scale scoring among Group P and Group L

Table – 9

Comparison of onset of anaesthesia (min)

Group	Count	Mean(min)	Std Deviation	Student t test

P	30	14.83	5.166	P = 0.6184
L	30	15.5	5.144	**Not significant**

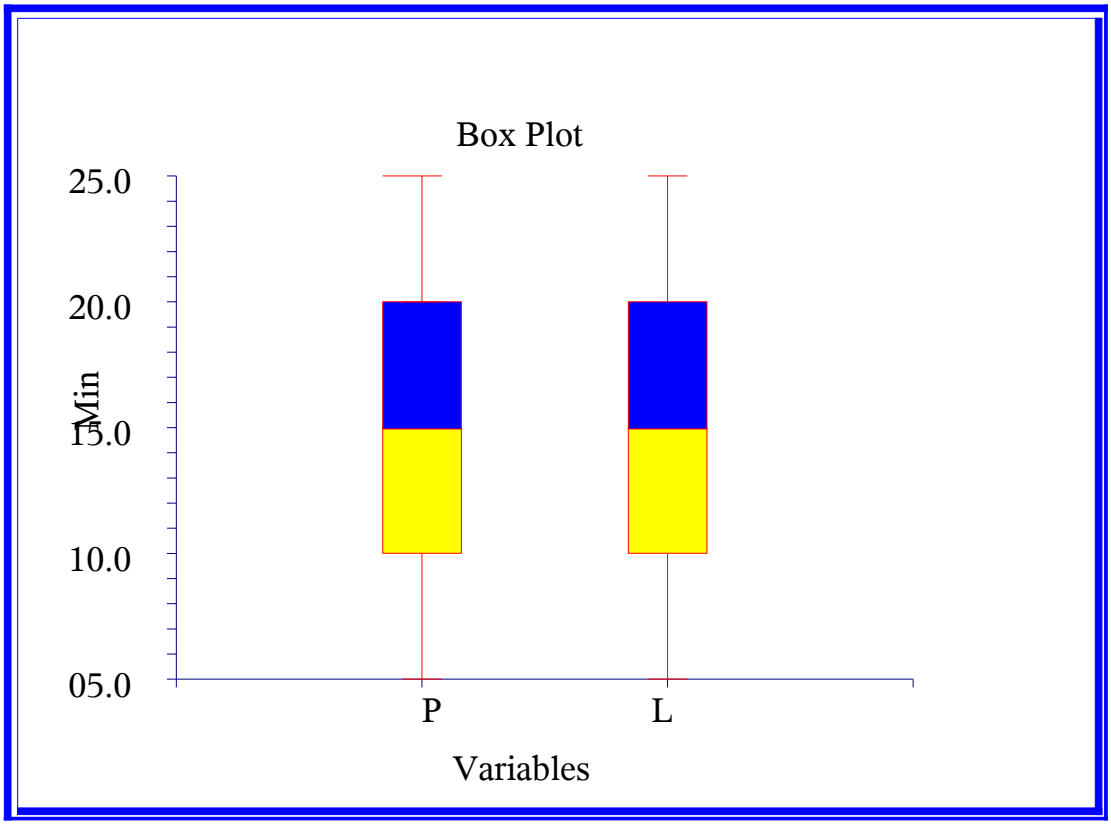


Figure: BOX PLOT showing onset of block among Group P and Group L

Table – 10

Comparison of Duration of Anaesthesia (min)

Group	Count	Mean Duration(min)	Std Deviation	Student t test
P	30	212.66	21.32	P = 0.1959
L	30	205.33	22.08	**Not significant**

Figure: Histogram showing Duration of Anaesthesia among Group P

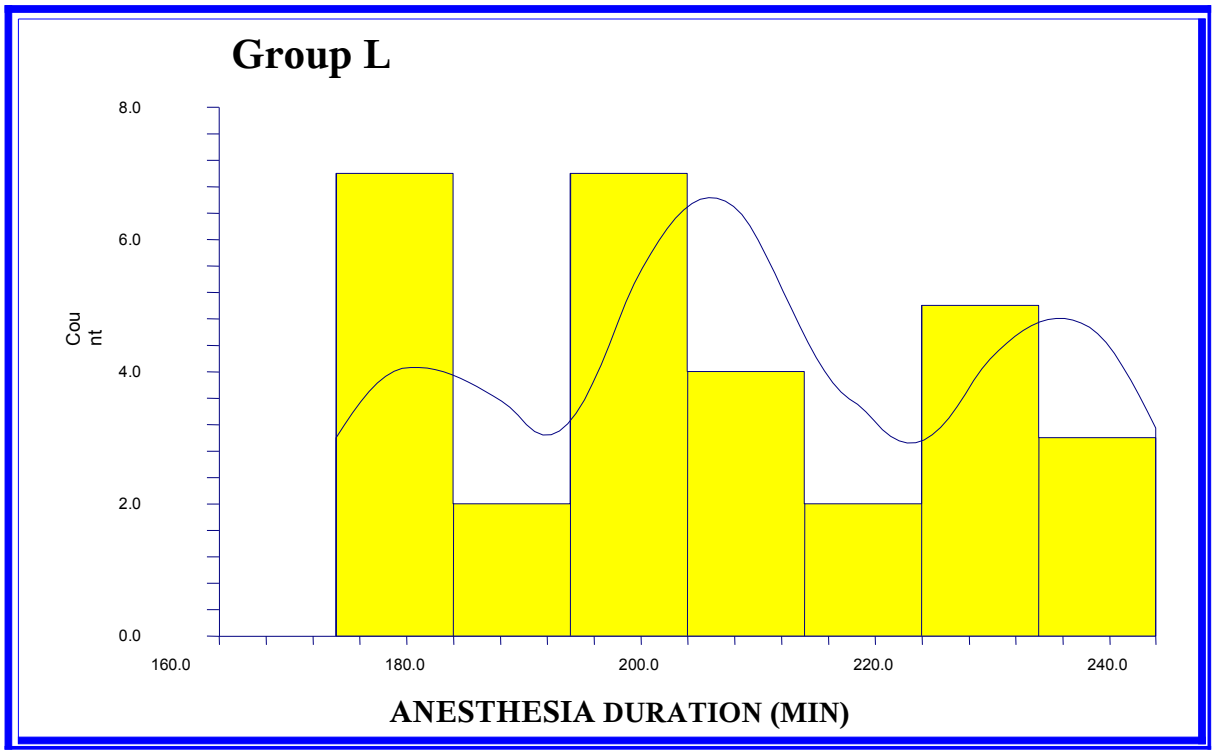


Figure: Histogram shows Duration of Anaesthesia among Group L

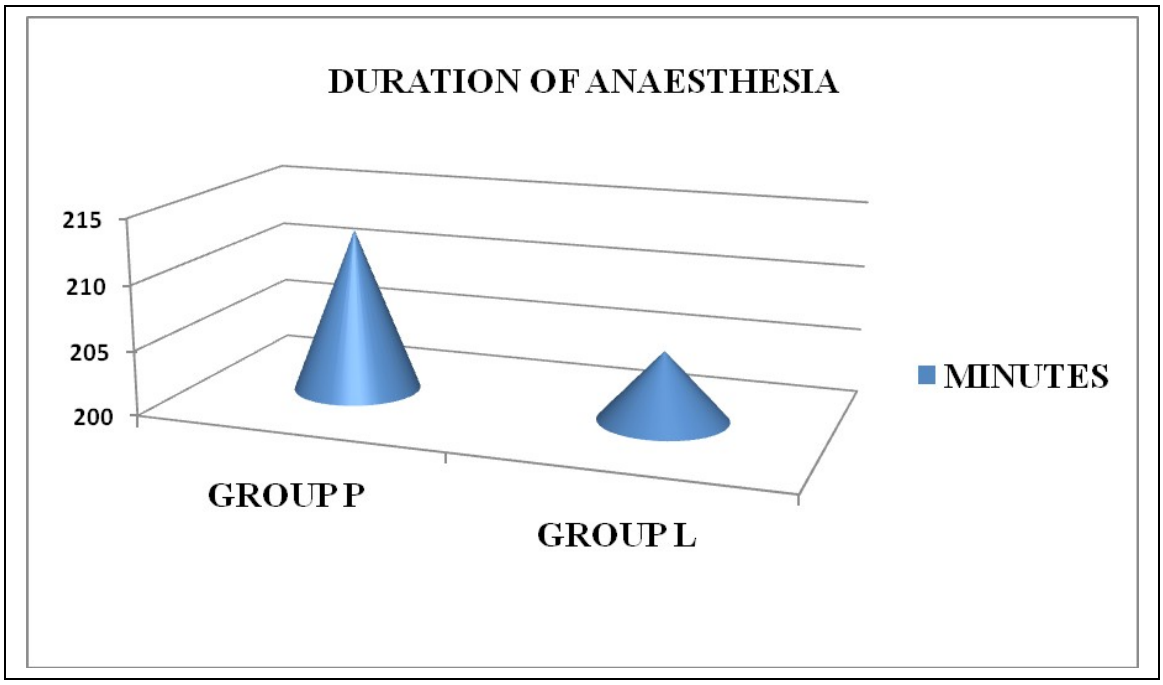


Figure: Comparing Duration of Anaesthesia among Groups P & L

DISCUSSION

Popliteal block is an excellent anaesthetic choice for foot and ankle surgeries. When used as the sole anaesthetic, popliteal block provides excellent anaesthesia and is devoid of the systemic and local complications seen with general, spinal and epidural anaesthesia.

Davis and McGlade[21] have shown that without a nerve stimulator, sciatic nerve blocks are frequently unsuccessful. Therefore the vast majority of sciatic blocks are performed using insulated needles and a nerve stimulator. We used Inmed nerve stimulator with low voltage current for nerve stimulation.

This study correlates with the study done by Dr. Palaniappan et al[16] which shows that the lateral approach is slightly more difficult technically, but the advantages are that it is more convenient with respect to the patient positioning and ease of needle placement.

60 patients of ASA Class I and II of both sex undergoing minor emergency surgeries like diabetic and traumatic foot debridement, tendo Achilles repair, amputation and filleting of toes between the ages of 18 and

70 were randomly allocated into two groups of thirty each.

Group P received popliteal block by posterior approach and Group L received popliteal block by lateral approach using 35 mL of 1% lignocaine with 165 μg of Epinephrine and 1.5 mL of sodium bicarbonate solution.

The dosage of Lignocaine, volume of local anaesthetic, onset and duration of action are described by text books and studies done by Manuel Taboada.et al [23]. They all concluded that 35 mL of 1%lignocaine can be used for popliteal block .

The dosage of Epinephrine and Sodium bicarbonate were described by **Tucker GT** and **Mather LE** [22]. They proved that lignocaine if combined with epinephrine and sodium bicarbonate hastens the onset and prolongs the duration of anaesthesia.

Our study shows that technically posterior approach was superior as the success of nerve location at first attempt was 66% as compared with lateral approach which was only 20%. This is comparable with studies made by Hadzic A, Vloka JD. It was 80% and 20% respectively.

There was significant difference in the stimulation of tibial or

peroneal nerve. Lateral approach resulted in 74% stimulation of peroneal nerve where in posterior approach it was 44% with a P value of 0.0092. This is comparable with the study made by Dr. Palaniappan et al[1.6]which showed a values of 72% and 31% respectively.

There was significant difference in the depth of needle insertion between the two groups. In posterior approach it was 39.46 mm whereas in lateral approach it was 54.83 mm.

Our study showed that lateral approach was more comfortable for the patient with a mean visual analog score of 1.56 when compared with posterior approach which had a score of 4.26.

In our study we found that none of the patients of either group developed complications.

There were no statistically significant difference among two groups in relation to onset and duration of anaesthesia.

SUMMARY

We assessed the outcome of popliteal block with posterior and lateral approaches in two groups of patients and the following observations were made:

- There were no significant differences between two groups in demographic data.
- Lateral approach is technically more difficult than the Posterior approach.
- Lateral approach is more comfortable for the patient than the posterior approach.
- Both approaches had no complications.
- There were no significant difference in time of onset and duration of anaesthesia.

CONCLUSION

Lateral approach of popliteal block has the advantage of less discomfort to the patient than that of the posterior approach with same quality of anaesthesia. Hence lateral approach of popliteal block is ideal for patients posted for foot surgeries where patient can be in supine position itself.

ANNEXURE I

PROFORMA

PROFORMA

Name:

IP no:

Age:

Sex:

Height:

Weight:

Surgical procedure:

H/O Habits:

H/O Medical Illness:

Last oral intake:

H/O Surgical procedures:

Airway assessment:

Vitals: BP PR

CVS

RS

Investigation

- Hb
- Urea
- Creatinine
- Random Blood Sugar
- ECG
- CXR

I.v line:

MONITORS:

Group (P/L)

Depth of needle:

Amount of Current (mA):

No of attempts:

Nerve stimulated: (Tibial / Peroneal)

Time of Anaesthetic administration:

Time of onset

Patient pain response to the procedure (VAS):

Duration of surgery:

Duration of anaesthesia:

Complication (if any):

Vitals chart:

HR

BP

SPO2

ANNEXURE II

MASTERCHART

GROUP P DEMOGRAPHIC DATA

S.no	IPNO	AGE(Years)	SEX	ASA	WT(Kg)	HT(cm)
1	344526	21	M	I	65	172
2	45362	30	M	I	57	165

	4					
3	344321	34	M	I	68	170
4	344524	42	F	I	54	153
5	334352	39	M	I	67	169
6	322451	56	M	II	52	163
7	314254	59	F	II	56	156
8	414235	50	M	II	67	170
9	314253	43	M	II	50	162
10	315436	49	M	II	64	159
11	324108	57	M	II	50	150
12	342189	65	M	II	67	160
13	342109	48	M	II	54	156
14	401235	68	M	II	61	170
15	319085	47	M	II	52	152
16	291043	64	F	II	57	152
17	315647	60	M	II	59	168
18	354621	34	F	I	51	160
19	401231	40	M	I	56	168
20	390421	50	F	I	59	146
21	300241	32	M	I	68	163
22	30403	29	F	I	73	152

	2					
23	311780	40	M	I	61	164
24	353513	43	M	I	51	157
25	376554	50	M	I	68	167
26	365142	35	M	I	56	159
27	291635	38	F	I	59	149
28	412377	47	F	I	56	154
29	417732	60	F	I	52	154
30	501326	43	M	I	75	174

GROUP P DATA Condt..

GROUP P DATA Contd..

SL NO	IP NO	ANA DUR(min)	PR(per min)	SPO2(%)	BP(mm Hg)
1	344526	200	56-90	100	110/68-129/89
2	453624	180	64-89	100	105/65-119/90
3	344321	230	67-100	100	100/76-130/89
4	344524	230	78-99	100	112/67-137/88
5	334352	240	80-108	100	110/68-132/92
6	322451	170	68-102	100	120/67-136/86
7	314254	200	70 -99	100	121/68-132/90

8	414235	200	67-07	100	112/67-129/90
9	314253	190	74-98	100	108/67-123/89
10	315436	180	80-110	100	120/84-139/90
11	324108	200	75-90	100	114/68-129/87
12	342189	170	67-94	100	116/83-132/90
13	342109	180	70-105	100	103/67-128/89
14	401235	210	78-110	100	108/78-130/91
15	319085	230	71-100	100	112/72-128/85
16	291043	210	56-88	100	118/68-130/89
17	315647	170	66-97	100	121/65-128/89
18	354621	190	68-89	100	109/81-128/89
19	401231	200	72-95	100	114/68-129/87
20	390421	180	81-102	100	110/68-129/89
21	300241	210	63-94	100	105/65-119/90
22	304032	240	71-99	100	120/84-139/90
23	311780	230	75-103	100	113/72-140/92
24	353513	200	83-110	100	118/83-129/88
25	376554	210	67-90	100	121/68-132/90
26	365142	220	64-102	100	120/67-136/86
27	291635	240	67-92	100	116/83-132/90
28	412377	230	74-103	100	114/68-129/87
29	417732	200	78-91	100	100/72-124/84
30	501326	220	71-89	100	117/74-128/87

GROUP L DEMOGRAPHIC DATA

GROUP L DATA .

IPNO	ATTEMPT	NERVE	DEPTH (mm)	ONSET (min)	VAS	SX DURATION (min)
319876	3	PERONEAL	56	05	1	50
396542	3	PERONEAL	54	10	1	45
300203	3	TIBIAL	45	20	2	60
309807	2	PERONEAL	52	15	2	40
410045	3	PERONEAL	51	10	1	35
401054	3	PERONEAL	49	10	2	30
400187	2	TIBIAL	56	20	1	45
390056	3	PERONEAL	57	15	3	30
342165	1	TIBIAL	49	20	1	40
320987	3	PERONEAL	60	20	1	40
347621	1	PERONEAL	61	20	2	35
405671	1	PERONEAL	59	15	3	40
402143	1	TIBIAL	56	15	2	25
395670	3	PERONEAL	55	10	1	35
380056	3	PERONEAL	57	20	2	40

391678	2	PERONEAL	54	10	1	30
309956	2	TIBIAL	49	10	2	30
344067	3	PERONEAL	48	05	1	30
344401	3	PERONEAL	55	15	2	45
406759	2	PERONEAL	49	20	1	30
491204	1	PERONEAL	57	20	2	25
411194	3	TIBIAL	60	15	1	30
446791	3	TIBIAL	61	10	1	30
301567	3	PERONEAL	62	15	1	25
337689	2	PERONEAL	58	20	3	30
311675	2	PERONEAL	55	20	1	35
401176	3	PERONEAL	57	25	1	40
434335	3	PERONEAL	54	20	1	25
340116	1	PERONEAL	54	05	1	40
361729	3	TIBIAL	56	20	3	25

GROUP L DATA Contd..

ANNEXURE III

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